

EMPIRICAL EVIDENCE ON TAX INFORMATION SHARING AMONG SUB-CENTRAL ADMINISTRATIONS

José María Durán-Cabré*

Alejandro Esteller-Moré*

Luca Salvadori**

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ABSTRACT

The literature on horizontal tax interdependencies offers limited attention to the interactions on administrative policies although they play an important role in determining the total tax revenues collected. The incentive for sub-central tax authorities to share relevant taxpayer-specific information has been accounted for in the literature on international capital mobility as part of a strategic behavior that trades off cooperation benefits versus competitive gains. In this paper we investigate these issues in a decentralized context with the aim to analyze the determinants of voluntary information sharing between regional tax administrations. We obtain results that are congruent with standard theory and in particular we find that some specific variables play an important role in determining the willingness of regional tax authorities to share taxpayer-specific information. In particular the presence of reciprocity between two regional administrations is associated with a higher number of tax information shared between them.

Keywords: tax information sharing, reciprocity, fiscal federalism

JEL Classification: H71, H77, H83

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* Universitat de Barcelona & Institut d'Economia de Barcelona (IEB).

** Corresponding author: Avda. Diagonal 690, 08034 Barcelona (Spain), e-mail: luca.salvadori@ub.edu.

1. Introduction

Tax administration policies are crucial in affecting the total revenues collected by tax authorities. Then investigating the determinants of these policies is a central issue. Such questions are of particular importance both within international frameworks and federal countries where the mobility of tax bases can make the tax administration dependent on the interaction and mutual influence established between countries or sub-central institutions. However, the literature on horizontal tax interdependencies offers limited attention to such matters and particularly, and possibly for this reason, there is no agreement on the optimal institutional form – centralized or decentralized – that tax administration should take in a federal context.

In general, the literature that analyses these issues has identified two main sources of interdependence. On the one hand, Cremer & Gahvari (2000), examining the implications of tax evasion for fiscal competition and tax harmonization policies in an economic union, prove the possibility of mobility-based competition in tax enforcement policies. They obtained sub-optimal equilibrium values for both tax and audit rates and stressed that tax harmonization alone is not sufficient to avoid the inefficient audit rate outcome. Durán-Cabré *et al.* (2012) have empirically tested this result for the Spanish federal framework and corroborate mobility-based competition in tax enforcement among regional administrations.

On the other hand, the incentive for sub-central tax authorities to share taxpayer-specific information has also been accounted for in the literature as part of a strategic behaviour that seeks a trade-off between cooperation and competition. In particular, studies have focused on the incentives for tax cooperation between states to reduce evasion in an international mobile-capital framework (see Keen & Ligthart, 2006a, for a survey). Indeed, technological developments and the removal of capital controls have greatly facilitated international capital tax evasion and it seems that the exchange of information might play an important role in dealing with these issues.

In this perspective, the seminal study by Bacchetta & Espinosa (1995) focuses on an international mobile-capital framework and sets up a two-stage game: in the first stage countries commit to information sharing

and in the second stage they set tax rates. The authors show that when non-residents' investments are subject to the domestic tax rate (*i.e.* tax authorities cannot discriminate between residents and non-residents in tax setting), tax administrations have the strategic incentive to share information with their foreign partners. Indeed, by so doing one government might induce a partner to set a higher tax rate in the second stage: knowledge of the information provision makes the first country less attractive for foreign investments (*i.e.* for international tax concealment). Then the strategic trade-off is between competitive behaviour – lowering the tax rate to increase foreign investment – and cooperative behaviour – voluntarily sharing information to reduce international tax evasion. In equilibrium, the second effect may dominate the former with the result of partial information provision.

In a more recent study, Bacchetta & Espinosa (2000) further their analysis of these questions by modelling the choice of tax rates and information provision as an infinitely repeated game and identify the incentives to cooperate and the conditions under which information sharing is optimal. A contribution in this same line is provided by Huizinga & Nielsen (2002) who model a repeated game in which tax authorities choose between withholding taxes and sharing information as alternatives for dealing with international capital income and profit taxation. Both studies argue that potential cooperation in information sharing is a matter of reciprocity and particularly it may be sustained if the choice of tax rates is viewed as an infinitely repeated game rather than a single one. In these models each country should then evaluate the trade-off that exists between not providing information and obtain a correspondent temporary gain (due to attracting tax evading investors), one the one hand, and suffering the cost of non-cooperative behaviour by the other country (generally, more aggressive tax competition or absence of information provision or both) forever after.

These contributions generated further theoretical studies of these questions (*e.g.* Tanzi & Zee, 2001; Chisik and Davies, 2004, Keen and Ligthart, 2006b). To the best of our knowledge, the only two empirical papers that test these models are Ligthart and Voget (2010) and Elsayyad (2012). Both papers refer the analysis to an international framework. In particular Ligthart and Voget (2010) study the determinants of tax information sharing between the Dutch tax authorities and foreign tax authorities for income tax purposes

while Elsayyad (2012) studies recent treaty signings between tax havens and OECD countries as the outcome of a bargaining process over treaty form and focuses on the presence of an exchange of information clause.

Investigating these questions by conducting an empirical analysis of a federal/decentralized context will undoubtedly represent a novelty in the literature and will also contribute to shed more light on the alternative designs (centralized vs. decentralized) for tax administration within a federal state. We aim to analyse the determinants of voluntary information sharing between regional administrations based on a study of the Spanish case. Spain is a good field for conducting empirical research. The Spanish regions (known as “Comunidades Autónomas”, henceforth CAs) have had the power to administer several wealth taxes since the mid-eighties and following reforms in 1997 and 2002 they also acquired the legislative power to modify significant tax parameters. Interestingly, the 1997 reform introduced official forums at which central and regional tax administrations might interact as well as the possibility of informal meetings being held between regional tax authorities. As such, Spain can serve as a benchmark for evaluating the information-sharing process in a decentralized framework and, more generally, for determining the optimality of a decentralized tax administration scheme.

In order to fulfil these objectives, we will study decentralized wealth taxes while focusing on a specific area of potential cooperation between the CAs. We refer to the application of the principles that indicate how tax revenues should be distributed among the CAs (the so-called “puntos de conexión” in Spanish). These rules are based on either the residence or the territorial source principles, depending on the taxable event, and regarding which taxpayers may be unaware. As a result, errors may appear when reporting tax returns: a taxpayer might pay the tax to a CA in which the revenue was not in fact produced according to the corresponding principle. Furthermore, following the devolution of normative tax powers to the regional level, a taxpayer might also behave strategically and present his or her tax return in a CA with relatively low fiscal pressure in order to evade payments. For this reason, each CA should share its information on misreported taxes and return all revenues to the competent CA. This practice is supposed to be applied as a rule, but it is not always necessarily the case. Indeed, there is anecdotal evidence that seems to confirm that

the information sharing process between CAs is far from automatic.¹ Indeed each CA needs to consider the trade-off between the incentive to retain misreported tax revenues and the incentive to obtain the transfer of tax revenues to which it is entitled. Moreover, following fiscal reform, a CA might have behaved strategically, giving out signals of low tax pressure via statutory tax rate cuts, so as to induce, to a certain measure, taxpayers to err in their tax returns with the aim of obtaining increased tax revenues. Therefore, our empirical framework reflects existing theoretical models at least for the framework present after the decentralization process. In the period prior to reform, the behaviour of the CAs can, it would seem, be examined by applying the prisoners' dilemma. This opens up the possibility of developing a theoretical model that incorporates the features of both periods so as to provide a better description of the CAs' behaviour.

Therefore, we wish to study the determinants of the CAs' willingness to engage in this information-sharing process.

2. Methodology

The theoretical literature provides a number of interesting insights for further investigation (see Bacchetta & Espinosa, 1995, 2000 and Huizinga & Nielsen, 2002 for formal theoretical models). Specifically, the role of statutory tax parameters, the marginal cost of public funds and enforcement costs seem to be crucial in determining the level of information exchange between local tax authorities. Moreover, the empirical literature conducted to date proposes several explanatory variables that should be taken into account in this analysis. According to Ligthart and Voget (2010), the regional size has a positive impact on the incentive to share information while distance between regions reduces the flow of information between them. As regards the Spanish case, variables such as reciprocity (a factor detected by Ligthart and Voget, 2010), the political

¹ For instance, in the 2006 report, the CA of Catalonia states: "It should be noted that existing experiences show an unequal behaviour of the different CAs in their degree of compliance with the obligation to submit the information and the due income to the competent CA. The perception that the competent services of the Directorate General of Taxes of the Catalan government have on this issue is that certain CAs systematically and, in many cases, violate that obligation." (p. 39 of the report). Moreover, from informal conversations maintained with past directors of the Catalan tax authority we know that to deal with this problem they choose not to transmit information to these CAs until the latter start to share their information. This seems to suggest that 'reciprocity' might play a relevant role in determining the extent to which information is shared between CAs. Indeed, and as a further evidence of this, in its 2002 report, the CA of Castilla León openly states that it would not return revenue due to the CA of Madrid until the latter transferred revenues due to them.

alignment between regions², and budgetary factors are further determinants that might have an impact on the tax administrations' willingness to cooperate.

Data and Empirical strategy

Data on the information shared by Spanish administrations (and used in constructing our endogenous variable) are extracted from the report “Informe sobre la cesión de tributos a las Comunidades Autónomas” published annually with the Spanish National Budget (“Proyecto de Presupuestos Generales del Estado”). More specifically, we have access to data on the total number and amount of transfers resulting from misreported tax returns (“Transferencias por aplicación de los puntos de conexión”) collected (returned) by each Spanish region (including those regulated by the “foral regime”) from (to) any other region during the period 1992-2010. Table 1 presents an example of this information for the CA of Madrid in 2009.

[TABLE 1]

Graphs 1 to 4 show the evolution of the aggregated information (graphs 1 and 2) and the total amount of tax revenues (graphs 3 and 4) transmitted by the CAs along the time. The evolution of these variables show a common time trend: both the alternative measures of the aggregate regional willingness to share information have increased during the available period. We will take this evidence into account when setting our empirical strategy.

[GRAPHS 1-4]

Our dataset allows us to identify both directions in the information-sharing process, which is undoubtedly an improvement on current studies in the literature. Moreover, the possibility that regional administrations might, over time, have learnt the advantages to be gained from cooperating (*i.e.*, from sharing information) provides us with the opportunity of adopting a dynamic approach. This would represent an additional methodological contribution to the literature.

² This factor is relevant since we refer our analysis to a federal context but it seems not relevant for an international framework analysis.

More specifically, we shall take as our endogenous variable the number of transfers made by each CA to every other CA in any given year and use the (time-lagged) information received by a CA as a regressor to control for reciprocity. As such, our endogenous variable is defined as count data and a Poisson regression model should serve as our main estimation strategy. However, our (partial)³ dataset contains 42.4 percent zero-valued output. Thus, we believe that our endogenous variable may be censored at zero inasmuch as a zero value could alternatively indicate an actual absence of information being shared or that CAs do not choose to share information and claim to have zero information to transmit. Looking at the distribution of our endogenous variable makes this problem much more evident. Graph 5 shows the total distribution (which support is $\{0, 1, 2, \dots, 10533\}$) and it seems to suggest that censoring at zero occurs. But actually since there are very few observations that report an extremely high cases of information shared this graph is not much informative. Graph 6 and 7 respectively presents the distribution of our endogenous variable for values smaller than 200 (this corresponds to 98% of the total cases) and for values smaller than 30 (around 90.6% of the total cases). Looking at those distributions the hypothesis of Poisson distribution seems reasonable. Then we maintain as our main approach the Poisson regression model.

[GRAPHS 5-7]

In order to deal with the high number of zeros in the distribution of the data we will also run a zero-inflated poisson regression (ZIP)⁴. Theory suggests that the excess zeros are generated by a separate process from the count values and that the excess zeros can be modeled independently. Thus, the ZIP model has two parts, a poisson count model and the logit model for predicting excess zeros (Mullahy, 1986, Lambert, 1992 and Staub & Winkelmann, 2012). In addition we will also perform a further analysis of robustness and following the approach by Ligthart and Voget (2010) we estimate a Tobit regression model accounting for censoring at zero.

³ Our current dataset comprises data only for the last 16 years as we are still waiting for the earlier years data to complete the data entry.

⁴ Since a proper command to run a ZIP model for panel data has not been developed we will employ the standard ZIP using cluster-robust standard errors, clustering with respect to our cross-sectional unit, the pair of regions.

Moreover in order to better identify the connections between two CAs we develop an additional model exploiting as endogenous variable the misreported revenue transmitted. The estimation strategy in this case will be alternatively the GLS random-effects model or the Within fixed-effects model. Finally we conclude proposing a dynamic extension of this model estimated through System GMM.

Before undertaking these analyses, we will perform a baseline estimation of the determinants of information sharing at an aggregate level.

2.1.1 *Baseline estimation*

The purpose of this analysis is to determine the factors that might influence the regional willingness to share information at an aggregate level.

$$TOTtransx_{it} = \rho_0 + \rho_1 TOTrecx_{it-1} + \rho_2 TaxRev_{it} + \rho_3 AuditRev_{it} + \rho_4 Defpc_{it} + \rho_5 Transfexp_{it} + \rho_6 El_{it} + \rho_7 Ded_{it} + \rho_8 Left_{it} + \rho_9 Pop_{it} + \vartheta_i + \tau_t + \epsilon_{it} \quad (1)$$

We will use as endogenous variable $TOTtransx_{it}$, the total number of information (or alternatively the total tax revenues) shared by any region i in year t with any other region. This is a measure of the aggregate regional willingness to share information. We introduce $TOTrecx_{it-1}$, the total information (or alternatively the total tax revenues) received by region i during the year $t - 1$ as a measure of aggregate reciprocity. $TaxRev_{it}$ and $AuditRev$ account respectively for total tax revenues and total tax auditing revenues collected by region i during year t . These variables are proxies of the regional tax autonomy and are expected to be associated with more information exchanged. The deficit per capita ($defpc_{it}$) and the total amount of transfers received from the central government divided by total regional expenditure ($transfexp_{it}$) are introduced to account for further relevant budgetary factors. In particular we expect these variables to be associated with less and more information exchanged respectively: a higher deficit (transfer-expenditure ratio) should force the administration to rely more (less) on own tax resources and then to share less (more) information with the other regions. El_{it} , is a dummy equal to one if there is an election in region i during the year t , is introduced to control for the electoral cycle. In particular a negative coefficient could be interpreted

as an inefficiency effect of the electoral process consequent to a paralysis in the tax administration waiting for a new government. In a similar way, a positive coefficient could be interpreted as a vote-seeking process. To account for possible normative modifications to the statutory tax parameters, we include a dummy (Ded_{it}) equal to one if the regional government i makes a marked deduction in (at least) one tax regime during the year t . $Left_{it}$ is another dummy variable equal to one if the party in office in a specific region and year is to the left of the political spectrum. Pop_{it} is the total population and accounts for regional size. We control for fixed effects ϑ_i and time effects τ_t while ϵ_{it} is the error term. We will estimate equation (1) through a Within-FE estimation strategy.

2.1.2 Poisson and Zero-Inflated Poisson regression models

Through this analysis we want to investigate the determinants of the actual information-sharing process that takes place between any two regions. Our empirical approach needs then to consider region pair-specific characteristics that describe the specific relationships taking place between any couple of regions that contribute to explain the willingness of one region to collaborate with the other regions in addition to the unilateral variables included in the baseline estimation. Our model is then:

$$Transn_{ijt} = \alpha_0 Recn_{ijt-1} + \alpha_1 Dist_{ij} + \alpha_2 RelGDP_{ijt} + \alpha_3 TaxRev_{it} + \alpha_4 AuditRev_{it} + \alpha_5 Defpc_{it} \\ + \alpha_6 Transfexp_{it} + \alpha_7 El_{it} + \alpha_8 Ded_{it} + \alpha_9 Left_{it} + \alpha_{10} Pop_{it} + \vartheta_{ij} + \tau_t + \epsilon_{it} \quad (2)$$

$Transn_{ijt}$ is our endogenous variable and represents the number of cases of misreported taxes transferred from region i to region j during year t . If we refer to the equation (1) we have that $TOTtransn_{it} = \sum_j Transn_{ijt}$. $Recn_{ijt-1}$ accounts for reciprocity between region i and region j and represents the number of cases of mis-reported tax revenues received by region i from region j during the year $t-1$. Also in this case referring to equation (1) we have that $TOTrecn_{it-1} = \sum_j Recn_{ijt-1}$. We expect this variable to affect significantly and positively $Transn_{ijt}$: a region's motivation to share information with another administration should reflect the past willingness of the latter to cooperate with the former. $Dist_{ij}$ accounts

for the distance between region i and region j ⁵. As suggested by the relevant theoretical literature we expect this variable to negatively affect the information sharing process. Since the distance is a fixed effect we specify a random intercept model⁶. $RelGDP_{ijt}$ is the ratio between the GDP of region i and region j and it is a measure of the relative economic power of the two regions. We expect this variable to negatively influence the inclination of region i to share information with region j . Indeed a higher relative economic power of region i with respect to region j reduces the reciprocity link between the two regions: region i could find profitable to send less tax information to region j because assumes to be less likely to obtain misreported tax revenues from a region which has less economic resources on which rely its budget sustainability. Then we control for political and budgetary variables of region i , ϑ_{ij} is a pair-specific random effect while ε_{it} is the error term. The parameters are estimated by maximum likelihood.

In addition to this model we also perform a ZIP model in which the inflated zeros are supposed to be generated by a separate process: the likelihood of inflated zeros is then predicted through a logit model (see Mullahy, 1986, Lambert, 1992 and Staub & Winkelmann, 2012 for the relevant econometric theory). We use two variable to explain the log odds of an inflated zero: a dummy variable equal to one if the partner administration (region j) did not share information with region i during the previous year and a dummy equal to one if the two governments are not politically aligned. We expect both variables to be positively associated with the probability of an inflated zero. If this is the case, it would confirm that a part of the information sharing process is driven by a strategic behavior.

2.1.3 Tobit model

$$Transn_{ijt} \equiv \begin{cases} Transn_{ijt}^* & \text{if } Transn_{it}^* \geq 0 \\ 0 & \text{if } Transn_{it}^* < 0 \end{cases} \quad (3)$$

⁵ In addition to the distance we also controlled for other common fixed effects such as common cultural roots (*e.g.* common local languages, belonging to the “foral regime”). We also controlled for a political alignment between the two regions (that is time variant). Unfortunately we do not obtain significant results probably due to the low variability and so we omitted these variables.

⁶ We also perform a population-averaged model using cluster-robust standard errors and a fixed effect model as robustness checks.

$Transn_{ijt}$ is the information transmitted from region i to region j during the year t while $Transn^*_{ijt}$ represents the latent variable, *i.e.* the propensity of region i to share information with region j :

$$Transn^*_{ijt} = \beta_0 Recn_{ijt-1} + \beta_1 Dist_{ij} + \beta_2 RelGDP_{ijt} + \beta_3 TaxRev_{it} + \beta_4 AuditRev_{it} + \beta_5 Defpc_{it} + \beta_6 Transfexp_{it} + \beta_7 El_{it} + \beta_8 Ded_{it} + \beta_9 Left_{it} + \beta_{10} Pop_{it} + \vartheta_{ij} + \tau_t + \varepsilon_{it} \quad (4)$$

The parameters of equation (4) are estimated by maximum likelihood.

2.1.4 Misreported-revenues based models

The analysis presented in this paragraph is intended to deepen the information sharing process employing $Transq_{ijt}$ the misreported tax revenues transmitted by region i to region j during year t as endogenous variable. We control for reciprocity through the misreported tax revenues received by region i from region j during the previous year $Recq_{ijt-1}$. Analogously to previous analyses we control for both region pair-specific characteristics and unilateral variables. Finally we extend this model in a dynamic fashion allowing for sluggish adjustment in the endogenous variable. Indeed it takes time to the regional tax authorities to process all the misreported tax revenues and it seems reasonable that the inertia plays a role in this process.

The model is then:

$$Transq_{ijt} = \delta Transq_{ijt-1} + \gamma_0 Recq_{ijt-1} + \gamma_1 Dist_{ij} + \gamma_2 RelGDP_{ijt} + \gamma_3 TaxRev_{it} + \gamma_4 AuditRev_{it} + \gamma_5 Defpc_{it} + \gamma_6 Transfexp_{it} + \gamma_7 El_{it} + \gamma_8 Ded_{it} + \gamma_9 Left_{it} + \gamma_{10} Pop_{it} + \vartheta_{ij} + \tau_t + \varepsilon_{it} \quad (5)$$

Following the reasoning explained in the previous paragraphs our main estimation strategy is the GLS random effect but we also include a Within fixed effect estimation as a robustness check. The coefficient δ accounts for inertia and is expected to be positive but biased if estimated through OLS or Within-groups estimators. Bond (2002, pag. 4) suggests that “a candidate consistent estimator will lie between the OLS and within-group estimates” and indicate the Difference GMM procedure (Arellano and Bond, 1991) as suitable

framework for obtaining it. Following Blundell and Bond (1998) we will employ a System GMM estimator (Arellano and Bover, 1995) that represents a more efficient version of the Difference GMM estimator.

3. Results

Our preliminary results are based on a dataset composed by the last 18 available years from which we can stress interesting insights on the information-sharing process that involves the Spanish regional administrations.

Baseline estimation

The table 2 presents the evidence obtained from the baseline estimation. In the first two columns our endogenous variable is the total information transferred by a region during one year and we account for reciprocity using the total information received from all the other regions during the previous year. In the other two models the endogenous variable is the total revenues transferred we use the total tax revenues received to account for reciprocity. These results seem to suggest that there are some common trends within the four models. The most important result regards the two alternative aggregate level of reciprocity that are positively related with the total information shared by the regions. This is a reasonable result and confirms the expected trend. We also find that the total revenues obtained through regional taxation, which accounts for tax capacity, is positively related with the endogenous variable as previously guessed. Also the revenues obtained through the auditing process are determinant but in an unexpected way: the higher the revenues the lower the information shared. We could interpret this result saying that enforcement policies and tax-information-sharing policies are substitutes: if a region is able to fight effectively tax evasion through auditing policies, it reduces the willingness to obtain misreported taxes through a tax information exchange process. Moreover also the political color seems to play a role: leftist governments share less tax information.

Main estimations: Poisson regression model and Tobit

In Table 3 we present the results of our main analysis. Specification (1) to (3) are Poisson regression models and they differ regarding the estimation procedure used (random effects, fixed effects and population-

averaged). Model (4) is a Zero-inflated Poisson model that report also the logit model used to predict inflated zeros, while model (5) is a Tobit regression model. First of all we analyze the results regarding the pair-specific variables. An interesting result that is robust to any specification regards the role of the reciprocity proxied by the information received by region i from region j during the previous year. The results obtained at an aggregate level with the baseline estimation are confirmed: the information shared by a region with another one positively depends on the information received from the latter in the previous year. This is the expected result: the willingness to share information with another regional tax administration positively depends on the past propensity of the latter to collaborate. Looking at the Tobit regression model we can observe that the magnitude of this variable on the transferred information is much higher than the one obtained with the Poisson regression model but this is reasonable since this specification controls for censoring at zero. A second important result regards the distance between the regions: this variable is very significant and robust to different specifications presenting negative coefficients: two distant regions share less information than two closer ones. This corroborates results from the previous literature. Also the proxy of the relative economic power is pretty significant and robust to different specifications. The results confirm what previously guessed: a higher relative economic power reduces the reciprocity and so the propensity to cooperate. Indeed a region that has a relatively more powerful economy finds it less profitable to collaborate with a region that, having a (relatively) reduced economic power, is perceived as having a limited propensity to share the information on misreported taxes. Looking at the unilateral variables a first interesting and robust result regard the tax autonomy: a higher tax autonomy corresponds to higher propensity to collaborate. Linking this result to the interpretation of the coefficient of the relative economic power lead to a further conclusion: a higher tax autonomy increases the willingness to cooperate and in particular the regional administration will collaborate more with regions that have a solid economic situation in order to increase the probability to obtain misreported taxes. The other budgetary variables present results that are not robust and such as the variable that collect the effect of the electoral cycle whose result seems to be very weak. In some specifications we obtain significantly different from zero and positive coefficient for the per capita deficit. This is congruent with the presence of income effects that suggests that the budgetary variables matters in determining this process. The electoral cycle also seems to play a role: in presence of election a region shares more information. This seems to suggest that there is a connection between the administrative

authorities and the political power seeking votes during electoral periods. Looking at the evidence on the variable that collect the effect of changes in the statutory tax parameters we can stress that a reduction in the effective tax rate of wealth taxes through a competition on the deduction schemes corresponds to less information transmitted. This is an interesting result that we interpret in the strand of the trade-off between competition and cooperation discussed in the literature: a region that is competing on wealth taxes in order to attract tax bases through a statutory tax parameters modification will be less likely to cooperate and share information. A further result seems to come from the political colour of the government that appointed the regional tax authority: a leftish government share less information. Nevertheless this result collect just a part of the political and cultural determinants and we will try to better specify our analysis introducing new variables defined at a more micro level. Looking at the regional size, proxied by the population, we find that it is positively associated with the sharing of information.

Looking at the ZIP model (column 4) we can also comment the logit model developed to explain the inflated zeros. The first variable that accounts for zero information received is positive and significant: it increases the log odds of an inflated zero. Instead the political un-alignment variable is not significantly different from zero. This analysis let us conclude that the strategic behavior to not transmit information seems to be driven (again) by reciprocity while there is not a possible role played by political variables.

Tax-revenues based analysis

In Table 4 we present an alternative analysis of the determinants of tax information exchange using data on the revenues transmitted and received by any regional administration. Even if this is just a preliminary analysis we can show some important results that confirm the previous analysis and add new evidence. The first two columns are respectively the GLS random-effects model and the Within fixed-effects model while the last one is an extended dynamic model estimated through System GMM. The most important result regards reciprocity that is confirmed as an important determinant of the information sharing process. In the last column we allow for sluggish adjustments in the revenue sharing process and we can stress that inertia plays an important role. Nevertheless the coefficient is not credible in magnitude terms and this calls for further analyses.

4. Conclusions

In this paper we have analyzed another level of tax interdependence that may occur in federal contexts: horizontal cooperation between sub-central administrations in the form of tax information sharing. In particular the study shows some evidence on the determinants of the information-sharing process among Spanish regional tax authorities. Our analysis suggests that information sharing is a matter of reciprocity corroborating the theoretical literature on international capital mobility and confirming the results of the previous empirical evidence. More generally the idea that reciprocity matters come also from the evidence that emerges from all the pair-specific determinants that are found to be significant and robust to different specifications. We also shed more light on the unilateral based determinants of the tax information exchange process showing that both budgetary and political variables are significant in explaining this process. Finally the analysis of an alternative measure of the tax information sharing process based on the tax revenues exchanged confirms our previous results and suggests that there could be a sluggish adjustment in the setting of this process.

Although the main purpose of this paper is positive we can also try to evaluate these results in a more normative perspective. The analysis suggests that the increasing level of information exchanged by each regional tax administration with each other depends on the level of reciprocity existing between the two regions. In this sense it seems that the decentralization of the tax administration had a positive effect on this potential area of cooperation between regional tax authorities suggesting that at least in this perspective the process of fiscal federalism taking place in Spain is then welcome.

5. Work in progress

In order to better characterize the behavior of the regional tax authorities and highlight the specific features that previous literature on international taxation did not take into account we are developing a very simple theoretical model that would help to raise the main hypothesis we want to test empirically.

Finally we are evaluating the possibility to collect some qualitative data through the implementation of a survey (in the form of questionnaire) to submit to all the CAs. This survey should serve to have a clearer picture of the level of collaboration/competition between CAs (as perceived by them) and possibly to define some micro-level variable such as the personal characteristics of the Directors of the regional tax authorities (e.g. gender, age, professional background: academic, public functionary etc.).

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TABLES AND GRAPHS

Table 1: Total number and amount of transfers from and to the CA of Madrid, 2009.

CA	MADRID – 2009			
	Transfers			
	Transmitted		Received	
	Number of cases	Thousands of euros	Number of cases	Thousands of euros
Andalucía	1867	11334	73	2452
Aragón	215	3681	5	250
Asturias	91	476	4	140
Baleares	140	891	3	22
Canarias	128	395	7	414
Cantabria	63	408	9	39
Castilla y León	919	4179	16	1630
Castilla-La Mancha	2289	12500	23	3006
Cataluña	208	1019	13	1515
Extremadura	926	5542	11	331
Galicia	264	2281	18	496
Murcia	461	2864	2	24
La Rioja	75	3076	1	4
Valencia	1809	11039	16	77
Navarra	6	19	0	0
País Vasco	10	17	1	2
Madrid	0	0	0	0
Federal government	18	175	2	50
Total	9489	59896	204	10452

Table 2: Baseline estimation (Aggregate willingness to share information, RE/FE estimation)

MODEL	(1) GLS-RE	(2) Within-FE	(3) GLS-RE	(4) Within-FE
Endogenous Variable	TOT_Transferred information	TOT_Transferred information	TOT_Transferred revenues	TOT_Transferred revenues
L.TOTReceived_Information	0.032*** (3.943)	0.029*** (3.618)	- -	- -
L.TOTReceived_Revenues	- -	- -	0.492*** (2.981)	0.360*** (3.168)
Tot_Reg_Tax_Revenues	284.559*** (6.905)	301.367*** (3.581)	895.388 (1.081)	3095.314** (2.925)
Tot_IGT_Audit_Revenues	-2294.004** (-2.438)	-2562.878** (-2.479)	-24213.133 (-1.019)	-34898.062* (-2.125)
DeficitPC	312.924 (1.351)	220.042 (0.938)	-1199.462 (-0.375)	-1286.310 (-0.389)
Transfers/Expenditure	-49.994 (-0.335)	22.944 (0.150)	2330.559 (1.187)	3623.558 (1.262)
Election Year	39.382 (0.711)	35.763 (0.649)	-130.770 (-0.176)	-401.030 (-0.546)
Deduction_IGT	-113.731* (-1.660)	-107.674 (-1.538)	-1586.634 (-0.727)	-1465.268 (-0.686)
Leftish Government	-93.978** (-2.071)	-131.485** (-2.457)	-688.692 (-1.022)	-1917.746** (-2.385)
Population	-26.255 (-1.366)	-33.855 (-0.135)	271.715 (1.123)	-5803.116 (-1.285)
_cons	495.158*** (4.184)	44.805 (0.077)	3597.778 (1.460)	13097.744 (1.287)
<i>N</i>	178	178	178	178
<i>R</i> ²	0.671	0.673	0.330	0.389
Fixed Effects	NO	YES	NO	YES
Time Effects	YES	YES	YES	YES

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Determinants of the information sharing process (Poisson regression model, RE-FE-PA, ZIP; Tobit)

MODEL	(1) POISSON RE	(2) POISSON FE	(3) POISSON PA	(4) POISSON ZERO- INFLATED	(5) TOBIT
Endogenous Variable	Transferred information	Transferred information	Transferred information	Transferred information	Transferred information
Main model					
L.Received_Information	0.00008*** (13.989)	0.00008*** (13.994)	0.0002*** (3.585)	0.0002*** (3.268)	0.014*** (4.911)
Distance	-0.001*** (-6.483)	- -	-0.001** (-2.502)	-0.002*** (-3.154)	-0.017*** (-2.596)
Relative GDP	-0.091*** (-3.007)	0.175** (2.500)	-0.148** (-2.440)	-0.152*** (-3.339)	-3.874*** (-3.249)
Tot_Reg_Tax_Revenues	0.193*** (8.983)	0.210*** (6.782)	0.345** (1.983)	0.306* (1.849)	16.949*** (4.381)
Tot_IGT_Audit_Revenues	-4.212*** (-9.752)	-4.064*** (-9.214)	-5.568 (-1.159)	-7.373 (-1.430)	-93.459 (-1.023)
DeficitPC	0.401*** (4.409)	0.421*** (4.571)	0.633 (1.042)	1.120 (1.460)	20.347 (0.916)
Transfers/Expenditure	-0.054 (-0.531)	-0.057 (-0.560)	-0.165 (-0.339)	-0.170 (-0.254)	-14.979 (-0.963)
Election Year	0.028 (1.484)	0.017 (0.904)	0.167* (1.739)	0.205** (2.248)	4.510 (0.886)
Deduction_IGT	-0.161*** (-6.836)	-0.152*** (-6.403)	-0.550** (-2.355)	-0.726*** (-2.871)	-11.600* (-1.791)
Leftish Government	-0.229*** (-8.237)	-0.227*** (-7.901)	-0.473* (-1.826)	-0.463* (-1.647)	-15.033*** (-3.194)
Population	0.204*** (4.032)	0.063 (0.718)	0.141* (1.709)	0.147** (2.090)	6.359*** (2.753)
_cons	3.647*** (19.721)		4.219*** (7.792)	4.835*** (8.120)	28.527** (2.276)
Inflated model					
L.Received_Information=0	-	-	-	1.622*** (12.829)	-
Different political color	-	-	-	-0.101 (-0.746)	-
_cons	-	-	-	-1.354*** (-9.734)	-
<i>N</i>	2572	2428	2572	2572	2572
<i>N=0</i>	975	-	975	975	975
<i>id</i>	219	207	219	219	219
Log likelihood	-16660.011	-15414.617	-	-35672.716	-9533.627
Wald chi2	24362.685	24266.833	770.923	502.788	423.010
p-value	0.0000	0.0000	0.0000	0.0000	0.0000
FIXED EFFECTS	NO	YES	NO	NO	NO
TIME EFFECTS	YES	YES	YES	YES	YES

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

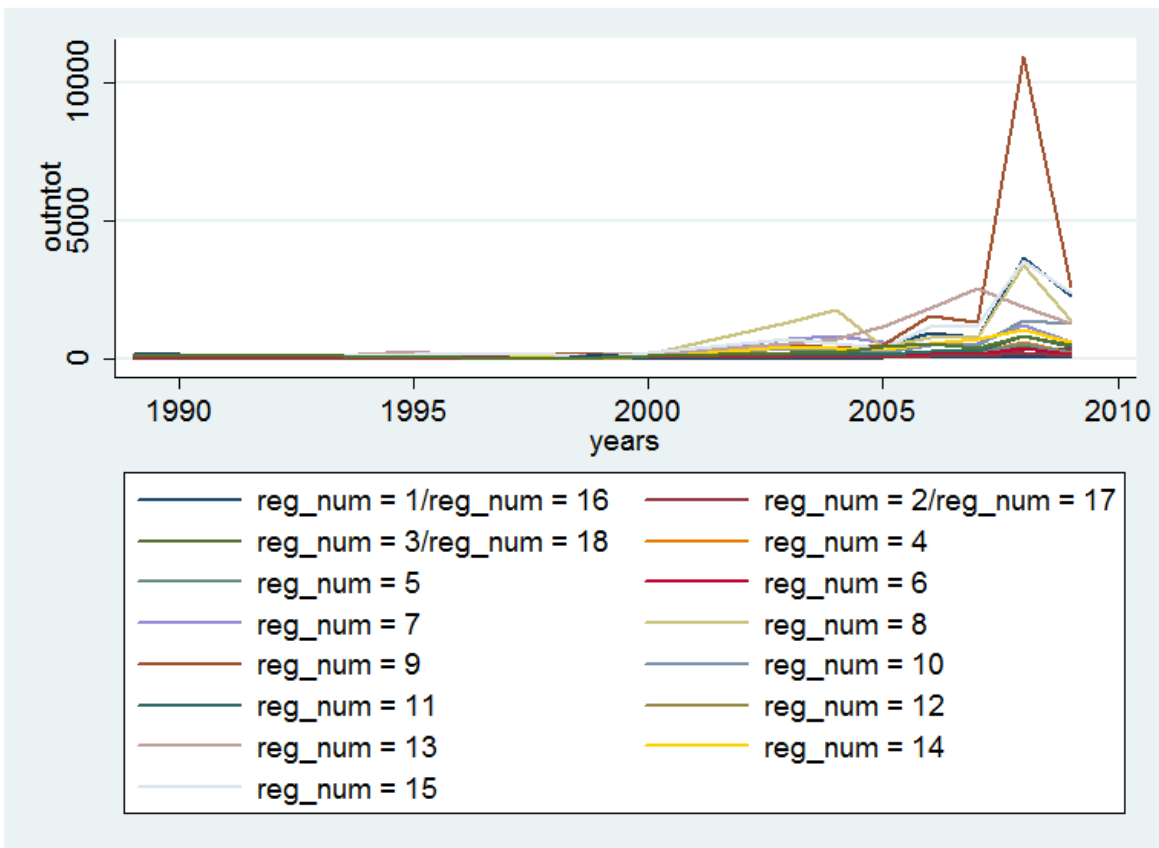
Table 4: Determinants of the information sharing process (Alternative endogenous variable RE/FE, System GMM)

MODEL	(1) GLS-RE	(2) Within-FE	(3) System GMM
Endogenous Variable	Transmitted Tax Revenues	Transmitted Tax Revenues	Transmitted Tax Revenues
L. Transmitted Tax Revenues	-	-	1.210*** (14.819)
L.Received Tax Revenues	0.806** (2.171)	0.563* (1.722)	0.204*** (3.984)
Distance	-0.127** (-2.128)	-	-0.074* (-1.917)
Relative GDP	-18.188** (-2.291)	128.486 (0.560)	-1.976 (-0.658)
Tot_Reg_Tax_Revenues	3.679 (0.059)	195.003 (1.154)	-13.607 (-0.491)
Tot_IGT_Audit_Revenues	-1403.375 (-0.945)	-2045.247* (-1.904)	-577.948 (-0.856)
DeficitPC	-220.287 (-0.592)	-90.901 (-0.337)	-99.200 (-0.533)
Transfers/Expenditure	267.620* (1.745)	340.213 (1.529)	139.225 (0.904)
Election Year	-4.377 (-0.059)	-26.148 (-0.305)	-92.551** (-2.203)
Deduction_IGT	-170.071 (-1.029)	-119.028 (-0.752)	-99.297* (-1.682)
Leftish Government	-64.456 (-0.887)	-153.037** (-1.987)	-72.840 (-1.235)
Population	43.395** (2.019)	-528.096 (-1.013)	20.519 (1.577)
_cons	262.784 (1.610)	1307.540 (1.297)	44.040 (0.523)
<i>N</i>	2190	2190	2190
<i>id</i>	219	219	219
Wald chi2	128.40	-	-
p-value	0.0000	-	-
F-statistic	-	3.52	-
p-value	-	0.0000	-
N° instruments	-	-	64
AR1 (p-value)	-	-	0.084
AR2 (p-value)	-	-	0.841
Sargan test (p-value)	-	-	0.000
Hansen test (p-value)	-	-	0.000
FIXED EFFECTS	NO	YES	NO
TIME EFFECTS	YES	YES	YES

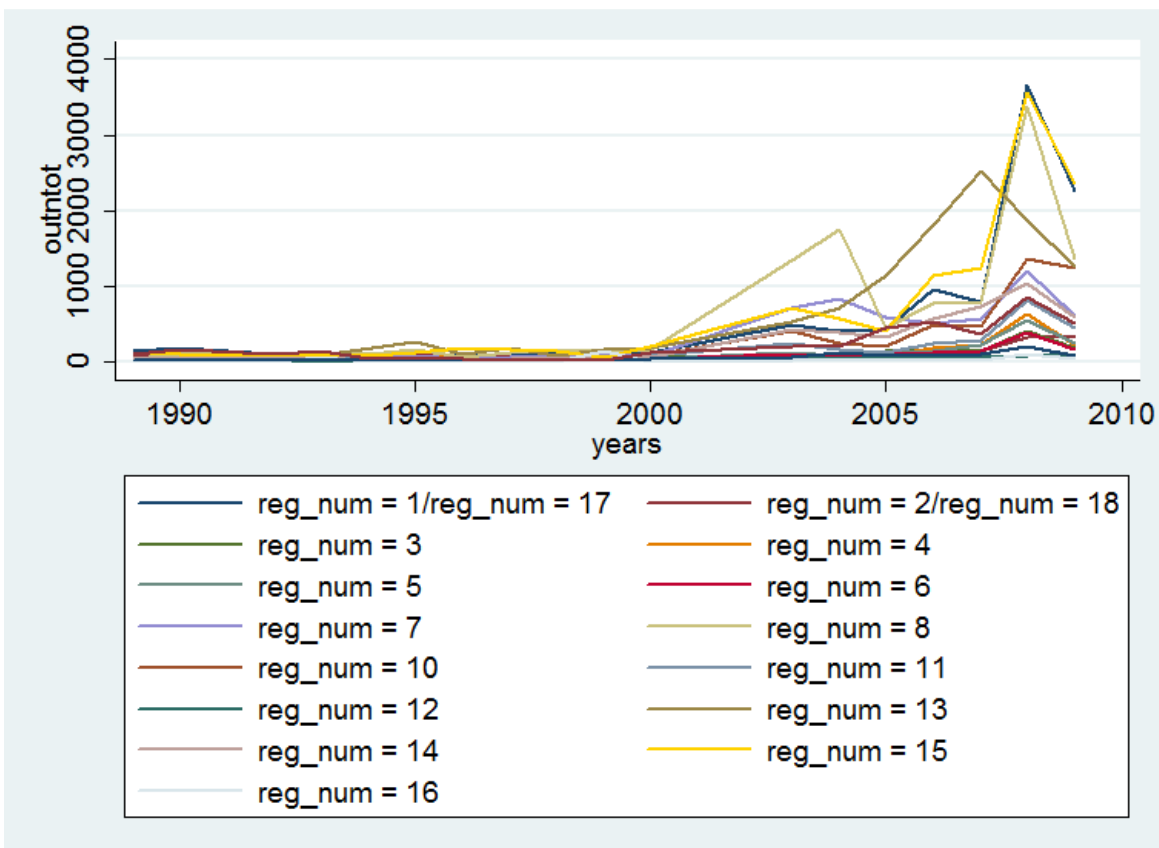
t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

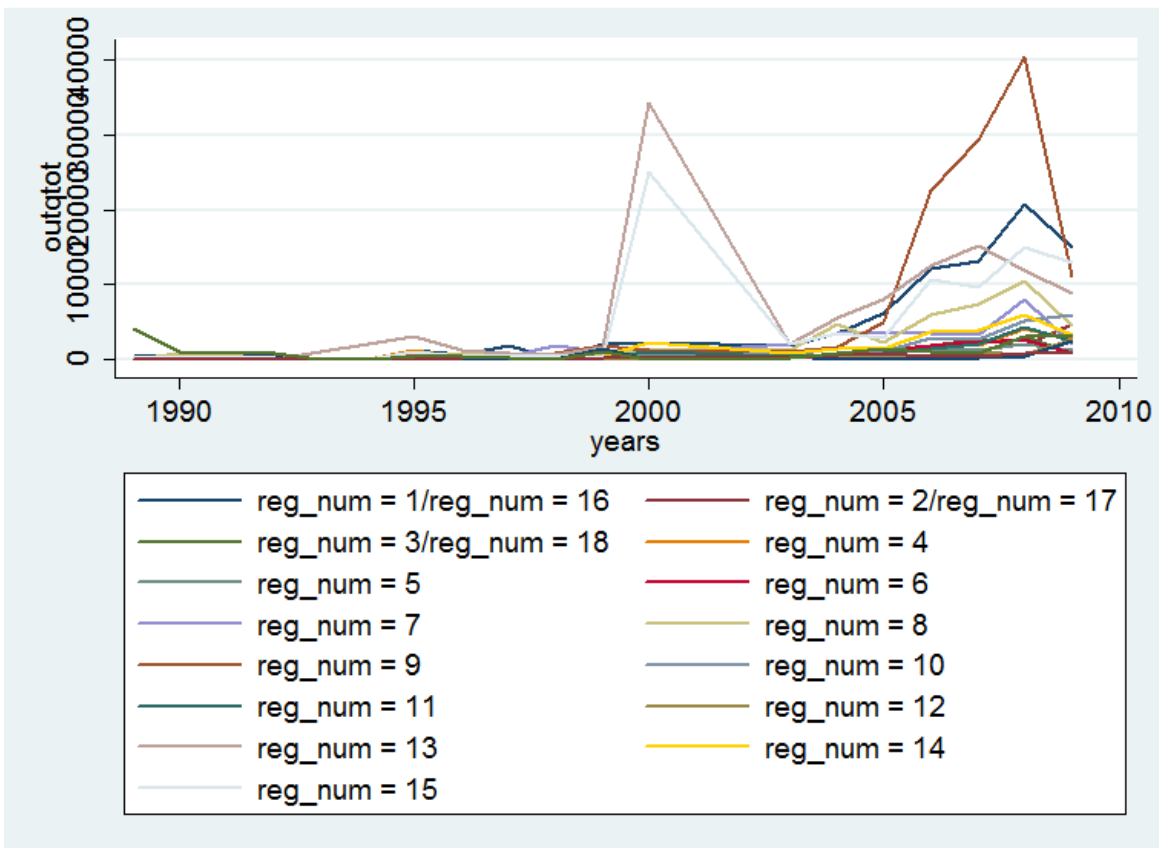
Graph 1: Evolution of the total number of information shared by the CAs (1992-2009).



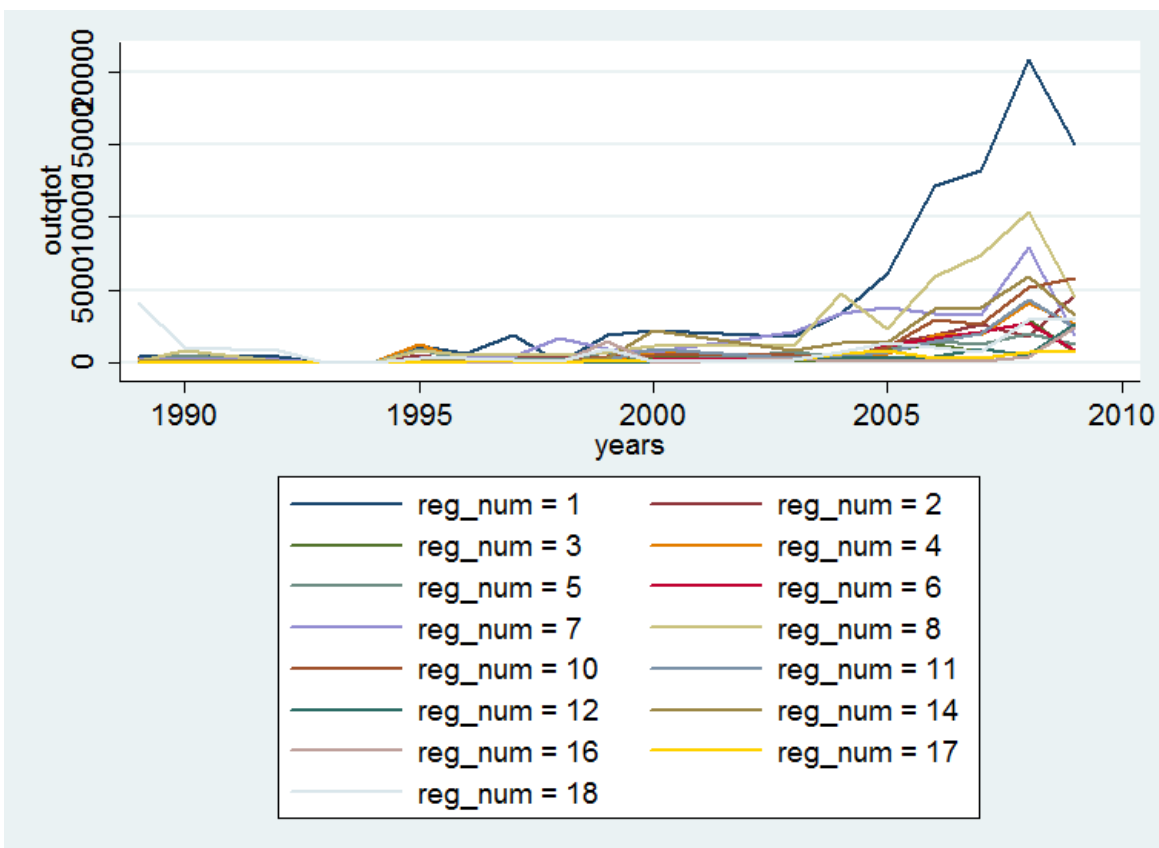
Graph 2: Evolution of the total number of information shared by the CAs (1992-2009) without Castilla La Mancha.



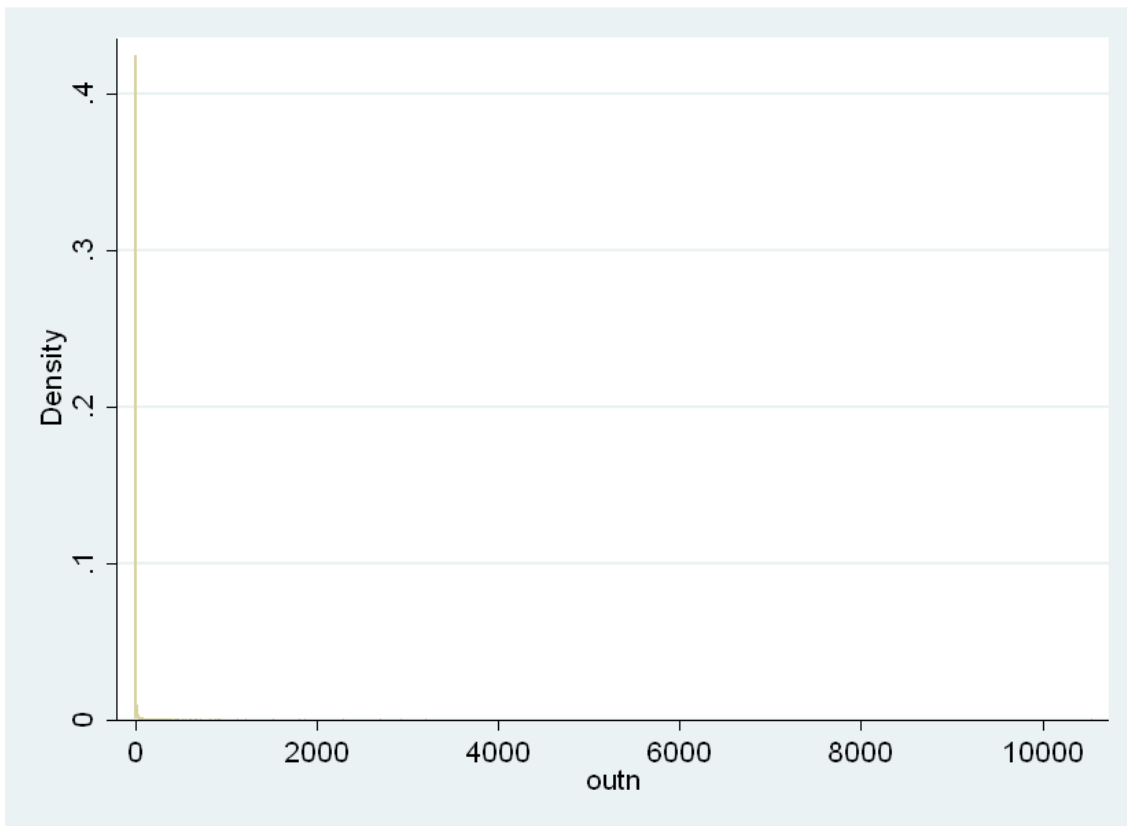
Graph 3: Evolution of the total amount of tax revenues transmitted by the CAs (1992-2009).



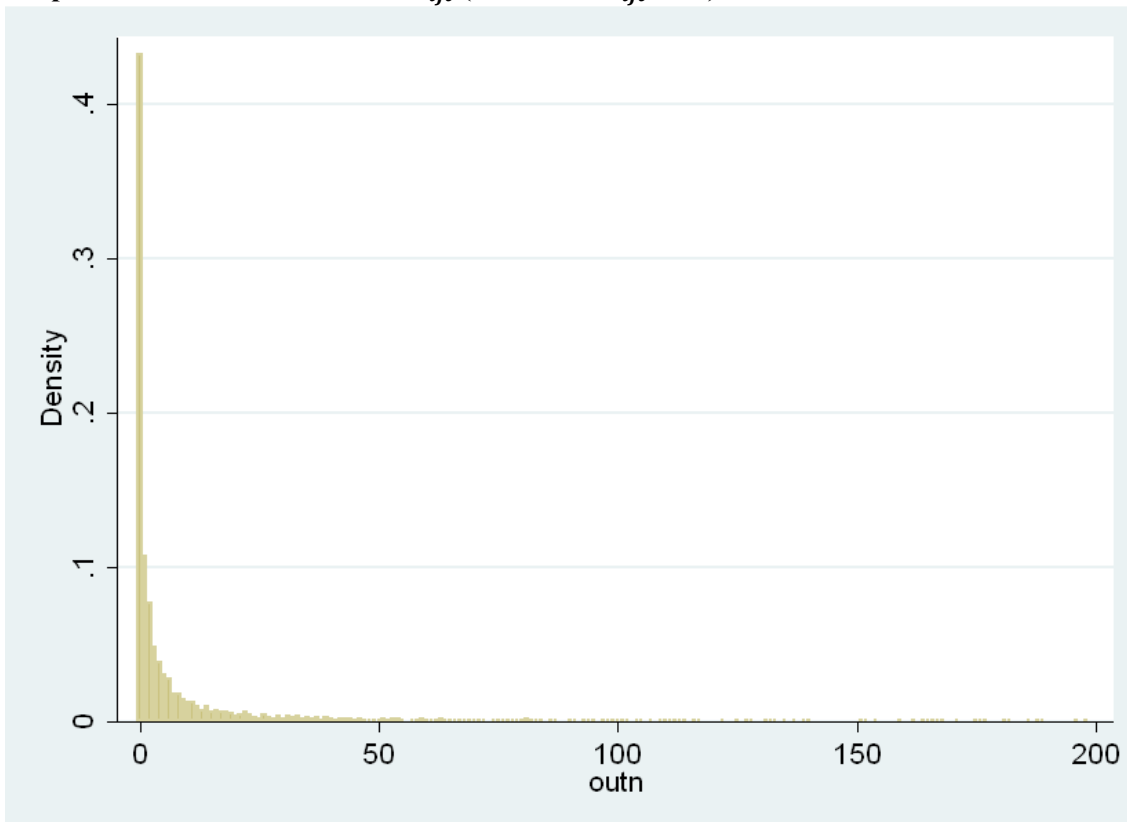
Graph 4: Evolution of the total amount of tax revenues transmitted by the CAs (1992-2009) excluding Madrid, Valencia and Castilla La Mancha.



Graph 5: Distribution of $Transn_{ijt}$ (total distribution)



Graph 6: Distribution of $Transn_{ijt}$ (for $Transn_{ijt} < 200$)



Graph 7: Distribution of $Transn_{ijt}$ (for $Transn_{ijt} < 30$)

